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BOOK REVIEW

Herbivores: Their Interaction with Secondary Plant Metabolites. Edited by Gerald A. Rosenthal and Daniel H. Janzen. 1979. Academic Press, New York. 718 pp. $59.50.

"Chemical ecology" is a maddening field. Almost devoid of theory (and utterly dependent on the coarse verbal "ploy-counterploy" model, which has changed little since proposed by G. Fraenkel in his classic paper "The raison d'être of secondary plant substances" 21 years ago), it consists largely of a collection of more or less pretty anecdotes. Yet the prettiest anecdotes are always the new ones; whenever a story is developed in detail, carried beyond the stage of descriptive natural history, its prettiness goes away and the evolutionary and functional scenarios become clouded. A good example is the phytoecdysones. There is indisputable appeal in the idea of plants outfoxing insects by confounding their development with large doses of hormone analogues. Yet most phytoecdysones that are ingested by insects are degraded by the midgut epithelium and cannot "function" in this way. In the "insect hormones" chapter of this new collection, Karel Sláma, who started this story going, sidesteps the degradation issue on page 693. Reese tackles it head-on on pp. 323–324.

"Herbivores"—the title is misleading and may help sales for the wrong reasons—is the latest attempt to integrate "chemical ecology." It brings together a great many pieces of the puzzle, but puzzle it remains. The field clearly still suffers from confusion over the concept of "function" in an evolutionary-biological context. The ecological and evolutionary chapters still suffer lapses into the unwarranted assumption that "compound X evolved in order to deter (poison) species Y" just because it is seen to do so now. This is tantamount to saying the function of DBCP is to sterilize workers in chemical plants!

Yet, full of hot air as they are—perhaps because they are—the ecological and evolutionary chapters are where the fun is. For most biologists the superb reviews of the major classes of secondary compounds are "chicken-wire chemistry" potentially useful for reference. Janzen's chapter, "New horizons in the biology of plant defenses," is outrageous as usual—and much to the point. "Herbivores do not eat Latin binomials," he says, reminding that Gertrude Stein did not mean a rose is a rose is a rose *biochemically*. Then he says "plants are anachronisms," and tells about things superbly adapted for seed dispersal by creatures which are extinct. (Phylogenetic inertia, the last refuge of scoundrels, is indeed untestable—and probably true.) His last two subheadings are "pitfalls" and "one-liners." Perhaps his next overview will include "pratfalls" and "howlers," both of which certainly apply in this field.

Among the various chapters, Chew and Rodman's stands out as a courageous (and ultimately unsuccessful, but that isn't important) attempt to calculate the energetic costs to a plant of defending itself chemically. The costs of defense have generated a lot of hot air, and this is the first attempt to do something concrete with the idea. Chew and Rodman don't succeed because it just isn't possible now to isolate that segment of the system from the plant as a whole, just the same as "optimization theory" in ecology has relied on extremely naive calculations which compartmentalize the time and energy budgets of organisms in questionable ways. A great many evolutionists act as if evolution can do *anything*. But the process of adaptation is non-Markovian; it does matter where you have been; and the mere fact that doing something is energy-inefficient means nothing about the opportunity of stopping. Perhaps lots of things are anachronisms, *sensu* Janzen.

Past work in this field has had a strong taxonomic bias; many "chemical ecologists" acted as if all herbivores had six legs. This book has less of an insect slant, but it still belongs on the shelf next to Keeler, VanKampen, and James' "Effects of Poisonous Plants on Livestock" (Academic Press, 1978) for the sake of balance. There are signs that phytopathologists, entomologists, vertebrate biologists, and vegetation scientists are finally converging on a common realization that the same compounds may have *multiple* "raisons d'être." This is all to the good. Anyone who considers him- or herself a "chemical ecologist" or "coevolutionary biologist" should have and read "Herbivores"; Janzen's cautionary chapter should be required reading for anyone considering doing this for a living. The cost of the book is ridiculous on its face, but decomposes to 8.3¢/page, which nowadays ain't all that bad.

The chemistry in the book is safe. Take the biology with a grain of salt (which, of course, may be dangerous to your health).

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